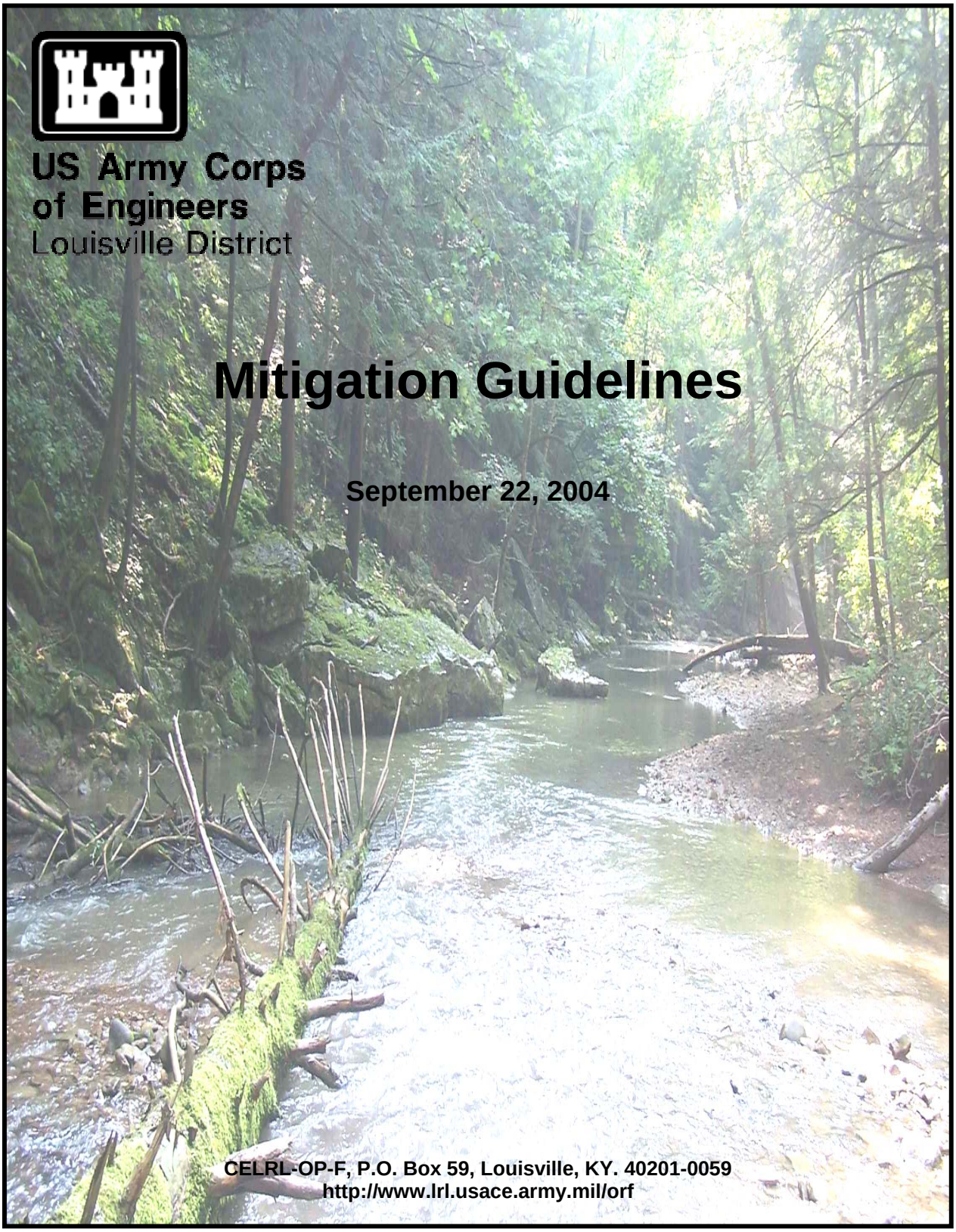

US Army Corps
of Engineers
Louisville District

Mitigation Guidelines

September 22, 2004

CELRL-OP-F, P.O. Box 59, Louisville, KY. 40201-0059
http://www.lrl.usace.army.mil/orf

Table of Contents

Acronyms & Common Terms

Acronym	Definition
CWA	Clean Water Act
DA	Department of the Army
FEMA	Federal Emergency Management Agency
HUC	Hydrologic Unit Code
NAS	National Academy of Sciences
NWI	National Wetland Inventory
T&E	Threatened and Endangered Species
USDA/NRCS	United States Department of Agriculture / Natural Resources Conservation Service
USFWS	United States Fish & Wildlife Service
USGS	United States Geological Survey
UTM	Universal Transverse Mercator

Preface

This guidance has been prepared to provide applicants and consultants with pertinent information required for satisfying the compensatory mitigation component of any Department of the Army (DA) authorizations under Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act of 1899. The concepts embodied in this guidance are intended to fully support the national no net loss policy for wetlands and to provide a plan that will effectively and fully mitigate impacts to aquatic resources, such as wetlands and streams. Regulatory Guidance Letter No. 02-2 dated December 24, 2002, developed in response to the 2001 National Research Council/NAS Study, *Compensating for Wetland Losses Under the Clean Water Act*, focuses on taking a watershed approach to mitigation, requiring wetland and stream mitigation in the context of the watershed's ecological needs, and ensuring protection of wetland and other aquatic areas established as mitigation. As per the *"Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404 (b) (1) Guidelines"* dated February 7, 1990, avoidance and minimization will be the first alternatives considered with any project proposal prior to the consideration of compensatory mitigation. The framework outlined in the following pages was developed in accordance with existing guidance and details what information must be addressed when compensatory mitigation is required.

There are four distinct types of compensatory mitigation: establishment (creation), restoration, enhancement, and protection/maintenance (preservation). These methods of compensatory mitigation are meant to replace the lost functions and values of wetlands and streams impacted by authorized activities. Restoration of former wetlands and streams is the preferred method of compensatory mitigation in the Louisville District. Creation will be evaluated on a case-by-case basis relying on supportive documentation that the location chosen for that mitigation site has a high potential for success. The functions and values of the impacted aquatic system will determine the replacement ratios for created mitigation sites. The functions lost from the time of impact until the mitigation site adequately emulates those lost functions will also be considered. Enhancement and preservation will not normally be considered as sole methods of compensatory mitigation, but may be used to augment the overall proposal in conjunction with restoration and/or creation. Mitigation proposals involving only preservation must include a justification and provide documentation defining a level of threat for future development or exceptional nature (e.g., high quality, scarcity, habitat for T&E species, etc.) of the proposed mitigation site. Permit applicants may also propose the use of mitigation banks, in-lieu fee arrangements, or separate activity-specific projects as alternatives to the above-referenced methods for compensatory mitigation.

Mitigation proposals should also include the establishment and maintenance of vegetated buffers, consisting of native species, around the mitigation site as well as existing open waters and wetlands remaining at the impact/project site. These vegetated buffers may include upland areas so long as they contribute to the enhancement of aquatic function and increase the overall ecological function of the mitigation site. The desired end state of any mitigation site is that it be self-sustaining.

The mitigation site should be constructed within the same 8-digit HUC watershed as the authorized impact whenever possible. On-site mitigation is preferred when the likelihood for success and sustainability are not compromised. The location and type of the mitigation site

should be chosen based on relative hydrogeomorphology. For wetlands the mitigation site should be situated in a manner that adequate self-sustaining hydrology can be ensured, and be dominated by hydric soils. In-kind compensation is preferred in the interest of achieving functional replacement, but out-of-kind compensation will be considered on a case-by-case basis.

Both the impact site(s) and the proposed mitigation site(s) will be evaluated prior to construction using the same functional assessment method. Methods that provide a functional assessment of the losses and gains of functions and values with the authorized impact and the compensatory mitigation respectively will be reviewed on a case-by-case basis. In all cases, the best available tool(s), combined with the best available information, should be utilized in light of the mitigation objectives.

The District may require all of the information outlined in this guidance be provided prior to approval of any compensatory mitigation proposal. Neglecting to submit all required data may result in a delay in processing of the project proposal. The Mitigation Plan Checklist ,provided in Appendix 5, should be completed and submitted with each proposal. A written explanation should be included for any piece of information listed on the checklist that is not included in your submittal. Before construction commences, 1) mitigation plans must be approved, 2) the mitigation site must be secured, 3) a permanent source of adequate water should be available, and 4) appropriate financial assurances must be established.

Construction of the mitigation site shall occur either prior to the authorized impacts or concurrently. There will generally be a minimum 5-year monitoring period on all mitigation sites. Larger, high risk, and/or complex projects may have a monitoring period extending to 10 years. If the mitigation site is deemed by the Louisville District to be failing and unlikely to provide adequate compensation for the losses, the permittee will be responsible for redesign and construction or the relocation of the mitigation site to ensure success.

All mitigation sites should be protected in perpetuity from future development by a restrictive covenant or permanent conservation easement. These instruments will be recorded on file with the appropriate county recorders office, attached to the abstract of title, and a certified copy of the registration will be provided to the Louisville District, Regulatory Branch. The registration will remain on file with the Louisville District.

This guidance is applicable to all proposals submitted to the Louisville District. In addition, for these guidelines to be most effective, they will remain open to comment and will act as a living document, subject to modification as needed. The most recent version of these guidelines will be posted at: http://www.lrl.usace.army.mil.

Any questions regarding these guidelines should be directed to the Louisville District Office at (502) 315-6733 or to one of our field offices:

Indianapolis, Indiana – (317) 532-4198,
Newburgh, Indiana – (812) 853-0472,
Cincinnati, Ohio – (513) 825-1901,
Carr Creek, Kentucky – (606) 642-3053.

Section 1: Baseline Information

I. Proposed Impact Site:

A. A brief **summary** of the proposed impacts and purpose of the project should be included as part of the mitigation plan. Wetland impacts should be defined in acres and stream channel impacts should be defined in linear feet.

B. The **narrative description** should address:

1. Detailed location information.

a. Directions to the site using road names, highway numbers and mileage distances.

b. Site location map including quarter section, section, township, range and UTM coordinates.

2. Relative geographic location within USGS 8-digit watershed (e.g., headwater, stream order, floodplain, etc.)

3. Surrounding land use:

a. Percentage of land use types(s) occurring within at least a 1000 ft band of the proposed impact area.

b. Significant land use(s) within the immediate watershed, which would affect the hydrological inputs or be affected by the hydrological outflows from the proposed impact area (including vegetated buffers/riparian corridors)

4. Classification:

a. Wetlands:

i. Hydrogeomorphic subclass & “first principles” (See Appendix 3 for more information on the Hydrogeomorphic Method (HGM)), if applicable, and

ii. Cowardin classification (See Appendix 4), and

iii. Landscape Setting (See page 124 of the NAS study referenced in Appendix 1 (I) (A))

b. Streams:

i. Rosgen Stream Type(s) (See Appendix 3), and

ii. Strahler Order (See Appendix 3), and

iii. Flow Regime (ephemeral, intermittent, perennial) (See Appendix 2 for definitions)

5. Existing conditions: Landscape Setting/Ecosystem Context

   a. Wetlands: Briefly describe the physical setting of the site, including, but not limited to adjacent land uses, ecological types, topography, buffers, and hydrogeomorphic features. Provide information on type of soil present (include hue, value and chroma for each soil horizon) and soil series.

   b. Streams:

      i. Describe site geomorphology (Channel pattern, profile, and dimension), substrate particle size distribution, canopy cover, riparian vegetation structure and complexity, hydrology/flow regime(s), channel habitat types (e.g. percentage of reach composed of pools, riffles, etc.).

      ii. Also describe stream functions such as, but not limited to, hydrology (i.e. efficient dissipation of energy) and biogeochemical processes (i.e. denitrification as indicated by presence of beds of organic matter).

      iii. Landscape Setting - (See NAS study, page 124) & River Continuum Context (Vannote, R.L., G.W. Minshall, K.W. Cummins, J.R. Sedell, and C.E. Cushing. 1980. *The River Continuum Concept*. Can. J. Fish. Aquatic. Sci. 37:130-137.) (See Appendix 2 for definition.)

6. Field observations (e.g., for wetlands use data sheets from the "Corps of Engineers Wetland Delineation Manual," Technical Report Y-87-1 or for streams use data sheets from EPA's Rapid Bioassessment Protocol, and show the location of the data points on a site map)

7. Climate (This component should address normal circumstances as described in TR Y-87-1, including local and regional variability and extremes)

8. Water Quality (e.g. denitrification, conductivity, pH); Identify any state listed CWA Section 303(d) impaired waterbodies within the watershed.

9. Identify the Functional Assessment Tool that will be used to measure the development of the mitigation site and ultimately the successful compensation of lost function and value from the permitted impact.

C. Maps (8 1/2" x 11") with project site clearly identified.

1. County road map

2. USGS quadrangle map

3. NWI Maps (81/2” x 11”), if available

4. FEMA Floodplain Maps, if available

D. Aerial Photography, if available

E. USDA/NRCS County Soil survey sheet for site

F. Photographs of the site with a corresponding photo orientation map

G. Identification of responsible parties: Provide names, titles, addresses and phone numbers for the following:

1. Applicant(s)

2. Contact person(s) if applicant is a company

3. Consultant or agent preparing permit application

4. Consultant or agent responsible for supervising or providing biological monitoring

5. Property owner (s)

II. Proposed Mitigation Site:

A. Briefly discuss the overall mitigation concept and purpose, then provide the same information as requested for the **Proposed Impact Site** (listed above) following the same format. The data points taken on the proposed mitigation site should remain consistent with the permanent photo stations identified in the subsequent monitoring reports.

B. Indicate who presently owns the proposed mitigation site. Availability of property must be clearly defined prior to final review. All easements and/or encroachments located on the proposed mitigation site must be identified. The applicant should own the mitigation site. The mitigation site should not be constructed on public lands unless the landowner is the responsible party.

C. Indicate expected ownership of the mitigation site following completion of the mitigation project. The responsible party for long-term management and protection of the site must also be identified. A signed management agreement must be submitted if an entity other than the permittee will assume management responsibilities following completion of the mitigation project.

Section 2: Goals and Objectives of the Proposed Mitigation

I. Using the information gathered under Section 1: Baseline Information, conduct a resource comparison of the impact site and the proposed mitigation site. This documentation should follow the format outlined below:

A. Functions & Values

1. Narrative profile of existing functions and values

    a. Site-specific discussion of the proposed impact site's functions and values

    b. Watershed/Landscape Context (What functions/values does the aquatic resource at the impact site provide within the surrounding landscape and watershed? And in what context?)

    c. If applicable, discuss the proposed project's impact on known functional impairments within the watershed (e.g. state listed CWA Section 303 (d) impaired waterbodies).

    d. Identify any rare or unique areas, including any known cultural resources, habitat designations and ecological types.

2. Predicted future functions and values

    a. Site-specific discussion of the predicted future functions and values of the mitigation site.

    b. Watershed/Landscape Context: What functions/values would the proposed aquatic resource provide within the surrounding landscape and watershed? And in what context?)

B. Functional losses on Proposed Project Site vs. Functional Gains on Proposed Mitigation Site

1. Methodology for measurement

2. Watershed Consequences (Although not required, providing information on a successful mitigation project or lessons learned on an unsuccessful project in the same watershed would be beneficial.)

3. Debits/Credits

    a. Acreage/Linear Feet (in addition to functional units)

b. Functional capacity (e.g., HGM Functional Capacity Units or Ecological Integrity Units)

C. Functional Replacement

1. In-Kind vs. Out-of-Kind

2. Holistic Aquatic Ecosystem Context (i.e., stream and wetland interactions)

3. Watershed/Landscape Context

D. Identification of Potential Challenges

1. Identify the potential challenges to the mitigation plan such as flooding, drought, invasive species, seriously degraded conditions, adjacent property problems, animal/waterfowl degradation to planted species, etc., that could pose a risk to the proposed mitigation.

2. Discuss how the mitigation plan accommodates these challenges along with potential remedial measures in the event that mitigation does not meet performance standards.

II. Provide a written narrative of environmental goals and objectives. These goals and objectives should be directly produced from the information gathered under Section 1: Baseline Information for the proposed impact site. Explain the theory/rationale behind selection of different components of the mitigation site and how those components compensate for the proposed impacts. Include a statement concerning the viability of the mitigation at the proposed location.

Section 3: Mitigation Work/Implementation Plan

I. Site Preparation:

A. Plans

Describe plans for the following criteria:

1. Grading
2. Hydrologic changes
3. Water control structures, if any
4. Exotic vegetation control
5. Erosion control
6. Bank stabilization, if applicable
7. Equipment and procedures to be used
8. Site access control
9. Strategy for minimizing soil compaction
10. Stream Pattern, Profile, and Dimension
11. Other

B. Soils/Substrate

1. Wetlands:

    a. Indicate whether or not the site has been scraped, filled previously, tiled, plowed, etc. Note which soil color chart is utilized (*e.g.*, Munsell or EarthColors) and the publication date of the chart.

    b. Identify the original source of any soil transported to the mitigation site. Soil origin is important if the applicant is proposing to use the seed bank from an impacted wetland.

2. Streams:

a. Identify type of substrate present (e.g., boulders, cobble, pebbles, etc) and the particle size distribution (e.g., pebble counts), channel habitat types (pools, riffles, runs, etc.)

b. Identify the type(s) and original source of any substrate transported to the mitigation site.

C. Hydrology

1. Identify the source of hydrology/water supply, estimated size of the watershed and connections to existing waters and proximity to uplands. In some areas, a water budget may also be necessary. Designs that manipulate wetland and stream processes with engineered structures and features, which require maintenance intensive plans, should be avoided.

2. Provide general information on the average frequency, depth and duration of water available to the site under normal conditions.

3. Install ground water monitors/piezometers to help evaluate groundwater elevations and/or flow (*this will be determined on a case by case basis by the Louisville District). See Sprecher, S. W. (2000). "Installing monitoring well/piezometers in wetlands," *WRAP Technical Notes Collection* (ERDC TN-WRAP-00-02), U.S. Army Engineer Research and Development Center, Vicksburg, MS. http://www.wes.army.mil/el/wrap/pdf/tnwrap00-2.pdf

D. Planting Plan

The planting plan and methods must be described in the proposed mitigation plan. The following information must be incorporated into the planting plan:

1. Provide a table of species to be planted, including numbers, spacing, types of propagules, pot sizes, etc. Scientific and common names must be used, as well as the appropriate indicator status for each species. Use the current regional U.S. Fish and Wildlife Service *National List of Plant Species that Occur in Wetlands*.

2. Indicate source-locale of seeds, plant plugs, cuttings, etc. Only native plant species may be used for the mitigation site. Hydrophytic vegetation may not consist of exotic or hybrid nursery species. Grass seed mix is commonly used to cover mitigation sites under construction. The use of **annual** non-native species will be considered. The species composition of the mix should be clearly documented, as well as any methods for eventually removing the temporary ground cover, if required (e.g. native, perennial grasses).

3. Show planting locations on a base topographic map according to species. The map must include elevations and proposed water levels. Demonstrate, in an attached narrative, that the appropriate plant species are being planted in suitable

areas (i.e. elevation, water depth, and soil type) and that the timing of planting will foster successful growth.

4. If transplanting is proposed, consider storage method and duration.

5. Describe any expected volunteer native revegetation that is included in mitigation planning.

E. Exotic and Undesirable Species Control

The plan must outline the methods proposed to prevent the introduction and/or establishment of invasive species such as Reed Canary Grass (*Phalaris arundinacea*), Cattails (*Typha* sp.), and Purple Loosestrife (*Lythrum salicaria*). The plan must also outline a management plan if any of these species are found.

F. Schedule

Time frames for construction of the mitigation site should be clearly documented within the proposal, as well as tentative monitoring times. The applicant should be aware that the *initial planting does not constitute the first monitoring period.* Monitoring of the site should commence in the first full growing season post initial planting.

G. Construction monitoring

Monitor the construction activities to ensure all aspects of the approved compensatory mitigation plan are completed without incident. This will normally require on-site management of the construction personnel by one or more of the permittee's representatives, who have complete knowledge of the plan and some understanding of soil science, hydrology, botany or plant ecology. The person(s) who prepared the mitigation plan should conduct the monitoring.

II. <u>As-Built Conditions:</u>

The plan must specify that the applicant will:

A. Submit a report, including construction documents, to the Corps within six (6) weeks of completion of site preparation and planting, describing as-built status of the mitigation project. If avoidance of existing wetlands and streams is incorporated into the development project design, then describe the as-built status of the development project. Include any deviations from the original plan in the vicinity of, or that will affect, the existing wetlands and streams. Submit separate reports for grading and planting work if not completed within six weeks of each other. *Initial planting reports are required but will not be considered as a monitoring report.*

B. Provide topographic maps showing as-built contours (for streams this would entail measurements of pattern, profile, and dimension) of the mitigation area. Indicate location of plantings and any other installations or structures. Hydrological tables should also be included illustrating the current and projected water levels for the mitigation site.

C. Submit a plan outlining the short and long term management and maintenance of the mitigation site.

D. Adequately field mark the approved mitigation site with *permanent* signs identifying the mitigation boundaries.

III. Financial Assurances:

The permittee or party responsible for accomplishing and maintaining the mitigation project, including contingency funds for adaptive management, is responsible for securing adequate funds to accomplish those responsibilities associated not only with the development and implementation of the project, but also its long-term management and protection.

A. Indicate what funds will be available to pay for planning, implementation, and monitoring of any contingency procedures that may be required to achieve mitigation goals.

B. Permittees may be required to prepare a letter of credit, performance bond or other instrument tied to the attainment of the success criteria.

Section 4: Success Criteria

I. Minimum Success Criteria:

A. **Wetlands**

1. A **wetland delineation**, including a survey of the boundary, must be submitted for Corps approval and verified by the Corps prior to release of the mitigation site. The acreage of the delineated area must be equal to or greater than the acreage required at permit issuance (refer to the *1987 Corps of Engineers Wetland Delineation Manual, Technical Report Y-87-1* ('87 Manual) with electronic updates or the most recently adopted Corps wetland delineation manual)

2. Vegetation

   a. Mean density per acre should match the proposed mean density per acre, based on compensatory mitigation objectives, and should be composed of at least 50% of the approved plant species (those species found on-site for five consecutive successful years.)

   b. No single species should constitute more than 25% (percent of areal cover) of the surviving species, unless specifically approved by the Corps in the mitigation plan prior to construction.

   c. Greater than 50% (percent of areal cover) of the surviving dominant species should meet the current federal delineation manual definition for hydrophytic vegetation.

   d. Native vegetation, excluding *Phragmites spp.* (Reed grass), *Phalaris arundinacea* (Reed canary grass), *Typha spp.* (Cattail) and *Lythrum salicaria* (Purple loosestrife), unless specifically approved prior to mitigation construction, should cover at least seventy percent (70%) of the compensatory mitigation site.

   e. The site should meet the proposed Cowardin classification. (See Appendix 4)

   f. By the end of the monitoring period, none of the dominant plant species, as defined by the '87 Manual, in any of the wetland community zones may be non-native species, including but not limited to *Phragmites spp.* (Reed grass), *Phalaris arundinacea* (Reed canary grass), *Typha spp.* (Cattail) and *Lythrum salicaria* (Purple loosestrife) unless specifically approved prior to mitigation construction. If any of these species are found to be dominant within the mitigation site, it must be removed and a management plan must be created and implemented to prevent the species from becoming a dominant.

3. Hydrology

   a. The site should meet the proposed classification (e.g., Cowardin, or HGM). (See Appendix 3 & 4)

   b. The wetland hydrology should match the proposed hydrology in Section 3, Part C of the Mitigation Work/Implementation Plan with regards to source, frequency and duration. At a minimum, the wetland should be inundated and/or saturated within the upper 12" of the soil for a duration greater than or equal to 5% of the growing season under normal conditions (or as defined in the current wetland delineation manual). Provide sample data that show site conditions fall within this success criteria. Table 5 of the *Corps of Engineers Wetland Delineation Manual, Technical Report Y-87-1* provides a description of hydrologic zones and percent duration.

   c. The site should be self-sustaining. Beyond any manipulation necessary to establish the vegetation, the hydrology of the site shall be sustained through natural processes in accordance with the design, including but not limited to precipitation, flooding, overland flow and directed flow from other adjacent waters or drainage tile under normal conditions.

4. Water Quality

   a. If a State Water Quality Certification is issued, the site should meet the standards set forth in that certification.

5. There should not be greater than ten percent (10%) deviation regarding surface area coverage of:

   a. Open water;

   b. Bare ground; or

   c. A combination of clauses a and b.

   between the impact site and the compensatory mitigation site, unless previously approved by the Corps.

B. **Streams**

1. Success criteria for compensatory mitigation for streams shall be based on the functional/bio-assessment of the stream being mitigated (see Section 1, Baseline Information) and address the following elements:

   a. Channel length

b. Channel mean width and depth

c. Channel volume and Residual Pool volume

d. Mean channel slope and sinuosity

e. Channel incision, bankfull dimensions, and bank characteristics

f. Substrate mean diameter, % fines, % embeddedness

g. Substrate stability

h. Fish concealment features (aerial cover of various types, e.g. undercut banks, brush)

i. Large woody debris (volume and number of pieces per 100 meters)

j. Channel habitat types (e.g. % of reach composed of pools, riffles, etc.)

k. Canopy cover

l. Riparian vegetation structure and complexity

m. Overall stream mitigation should be self-sustaining, relying on natural channel designs and features.

n. Water quality - If a State Water Quality Certification is issued, the site should meet the standards set forth in that certification.

II. Project Specific Success Criteria for Wetlands and Streams:

Each compensatory mitigation plan shall include project specific success criteria that are:

A. **Based on the targeted functions and values** of the compensatory mitigation as compared to those identified from a functional assessment of the aquatic resource impacted at the development site (see Appendix 3 for assessment protocols).

B. **Measurable**

C. **Achievable**, based on the purpose of the compensatory mitigation, design of the site, and functional assessment criteria. by the end of the maintenance and monitoring period.

III. Include measurable performance standards to track progress toward achieving the success criteria.

Section 5: Monitoring

I. Monitoring Reports:

Annual reports should be sufficient unless there is any unforeseen circumstance that might put the potential success of the project into question. In that case, biannual reports may be required. All annual reports will be submitted to the District by 30 January for the previous year.

A. Timing

1. Biannual inspections should be completed in the first month of the growing season and the last month of the growing season for each calendar year. Reports should be submitted annually. The first monitoring report is due after the first full growing season post initial planting.

B. On-Site Method

1. Establish permanent photo stations from which photographs will be taken and attached to each monitoring report. Additional photos may be necessary to illustrate the conditions on site on an as needed basis. A site map should be included illustrating the surveyed locations of the photo stations and the direction in which the photos were taken.

2. Data forms (e.g., *Corps of Engineers Wetland Delineation Manual, Technical Report Y-87-1*, or EPA's Rapid Bioassessment Protocol Habitat sheets) must be used in evaluating points within the mitigation site and should be included with the report. Double-sided pages are preferred. These points should be depicted on a site map.

C. Documentation

Document the conditions at the mitigation site. Provide a written summary of how the site meets/does not meet the goals and objectives (Section 2). The initial report should include any deviations from the Mitigation Work/Implementation Plan (Section 3). The following format and sequence should be used in the development of the monitoring report:

1. Soils – Describe any changing properties of the soil, including, but not limited to redox potential, organic matter content, and nutrient availability. Assess whether the soils are functioning as hydric soils and/or exhibiting any field indicators as described in the Y-87-1, *1987 Corps of Engineers Wetland Delienation Manual*.

2. Vegetation – Describe how the success criteria are being met, including, but not limited to survival rate of planted species, ratio of planted species vs. volunteer species, presence of exotic species, percent cover, canopy cover, and riparian

vegetation. Also include a species composition list including both scientific and common names and indicator status.

3. Hydrology – Describe sources of hydrology (e.g. precipitation, overbank flooding, groundwater). Include consideration of water depth, frequency, and duration of inundation. If required, include record of groundwater table elevation. (as previously stated in Section 3, the necessity of monitoring groundwater table elevations will be determined on a case by case basis by the Louisville District)

4. Water Quality (e.g. conductivity and pH)

5. Remediation – Describe any remedial measures implemented to ensure successful establishment of a self-sustaining ecosystem (i.e. replanting due to high mortality rates, lack of mowing in buffer zones)

D. Responsible Parties: Provide a list of the names, addresses and phone numbers of persons/entities responsible for each type of sampling and report preparation.

II. Assessment of Function/Value Replacement:

Describe development of functions and values such as flood storage, aquatic and terrestrial habitat, etc.

Specific approaches (i.e. functional assessment method) should be used to determine if performance standards have been met. Discuss how each performance standard is supporting the objective for stream/wetland replacement. If a performance standard is not met for all or any portion of the mitigation area in any year, the permittee shall provide an analysis of the cause(s) of failure and proposed remedial action(s).

A. Use the functional assessment method chosen to support the goals outlined in Section 2 (i.e. What does a specified density mean in the function of a wetland? or How will the addition of a riparian corridor affect stream quality?)

B. Compare and contrast results of monitoring with Baseline Information (Section 1)

III. Release from Monitoring:

A. Prior to request for release from monitoring, a delineation of the mitigation site should be conducted by an individual(s) with formal wetland delineation training and must be submitted with the final annual monitoring report requesting release from further monitoring. This report should include an explanation of how the goals of mitigation have been met, a discussion of the wetland/stream ecosystem's ability to be self-sustaining, and a comparison of the impact site with the mitigation site using the same functional assessment method. An inspection of the site will be coordinated with the applicant and conducted by the District to confirm the completion of the mitigation plan.

B. If required, copy of the **recorded restricted covenant or permanent conservation easement** on the mitigation site must be submitted to the District prior to release from monitoring.

Section 6: Contingency Plan

I. Reporting Protocol:

If a success criterion is not met for all or any portion of the compensatory mitigation project in any year, and/or if the success criteria are not satisfied, the permittee shall prepare an analysis of the cause(s) of failure and, if determined necessary by the Corps, propose remedial action for pre-approval.

II. Response to unsuccessful remediation:

Indicate course of action to be taken in the event that the Corps determines the compensatory mitigation cannot be successfully achieved at the intended site.

Appendix 1: Sources of Information

The following is a list of potential sources of information that may be used in developing compensatory mitigation:

I. **General:**

A. *Compensating for Wetland Losses Under The Clean Water Act*, Committee on Mitigating Wetland Losses, Board on Environmental Studies and Toxicology, Water Science and Technology Board, Division on Earth and Life Studies, National Research Council; National Academy Press, June 2001, Washington D.C.: http://www.nap.edu/catalog/10134.html?onpi_newsdoc062601

II. **Vegetation:**

A. Natural Resources Conservation Service Plants Database: http://plants.usda.gov/

B. *"National List of Plant Species that Occur in Wetlands"* (by Region), U.S. Department of the Interior, Fish and Wildlife Service: http://www.nwi.fws.gov/bha/

III. **Soils:**

A. County Soil Surveys available at local Natural Resource Conservation Service (NRCS) offices.

B. Munsell Soil Color Charts, MacBeth Division of Kollmorgen Instruments Corp. 1994 edition. Baltimore, MD.

C. EarthColors Soil Color Book, Color Communications, Inc. 1997. Chicago, IL.

IV. **Hydrology:**

A. Pierce, Gary; *Planning Hydrology for Constructed Wetlands*; Wetland Training Institute, Inc.; 1993.

B. Sprecher, S. W. (2000). *Installing monitoring well/piezometers in wetlands, WRAP Technical Notes Collection* (ERDC TN-WRAP-00-02), U.S. Army Engineer Research and Development Center, Vicksburg, MS. http://www.wes.army.mil/el/wrap/pdf/tnwrap00-2.pdf

Appendix 2: Definitions

These definitions were selected for use with this document. We recognize that other definitions may exist for some of these terms in other documents.

Clean Water Act: Primary federal law that established a dredge-and-fill permit program to protect the waters of the United States, to include wetlands. When originally enacted the statute was formerly known as the Federal Water Pollution Control Act (FWPCA). In 1977 amendments to the FWPCA, Congress adopted the statute's more popular name, the Clean Water Act.

Enhancement: An increase of one or more functions of an aquatic resource by human modification.

Ephemeral (waterways): A waterway having flowing water only during and for a short duration after precipitation events in a typical year.

Establishment (Creation): The manipulation of the physical, chemical, or biological characteristics present to develop a wetland on an upland or deepwater site, where a wetland did not previously exist. Establishment results in a gain in wetland acres.

Fill: as amended in the Federal Register on May 9, 2002 "material placed in waters of the U.S. where the material has the effect of either replacing any portion of a water of the United States with dry land or changing the bottom elevation of any portion of a water. The examples of ``fill material" identified in this rule include rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mining or other excavation activities, and materials used to create any structure or infrastructure in waters of the U.S."

Hydrologic Unit Code (HUC): The US Geological Survey established a national framework for cataloging watersheds of different geographical scales. Each watershed level in the hierarchy is designated using the hydrologic unit cataloging system. At the national level, this system involves an 8-digit code that uniquely identifies four levels of classification: region, sub-region, accounting code, and cataloging unit.

In-Kind: Restoration, Creation, Enhancement, or Preservation of waters similar to those being impacted.

Intermittent (waterways): A waterway having flowing water during certain times of the year, when groundwater provides water for stream flow.

NWI: National Wetland Inventory: a tool generated by the U.S. Fish and Wildlife Service using infra-red aerial photography to evaluate wet areas on the land's surface. These areas have not been field checked and therefore, although this is a useful tool, this coverage is not always an accurate assessment of on-site conditions. Field investigations are the only true means of determining the presence or absence of "waters of the United States."

Out-Of-Kind: Restoration, Creation, Enhancement, or Preservation of waters that provide different functions than those being adversely affected by a project.

Lentic: Applied to a freshwater habitat characterized by calm or standing water (e.g. lakes, ponds, swamps and bogs).

Lotic: Applied to a freshwater habitat characterized by running water (e.g. springs, rivers and streams).

Perennial (waterways): A waterway that flows year-round during a typical year.

Protection/Maintenance (Preservation): The protection of ecologically important wetlands or other aquatic resources in perpetuity through the implementation of appropriate legal and physical mechanisms.

Propagules: Any spore, seed, fruit or other part of a plant or microorganism capable of producing a new plant and used as a means of dispersal.

Restoration: Re-establishment of wetland and/or other aquatic resource characteristics and function(s) at a site where they have ceased to exist, or exist in a substantially degraded state.

River Continuum Context: Is based on the river continuum concept (RCC), which asserts that the biological community in a stream system is largely regulated by geomorphological factors (Vannote, *et al*, 1980, 131). The concept states that community structure in natural stream systems is structured in order to capitalize on the most efficient energy utilization throughout.

Vegetated Buffers: Vegetated upland or wetland area next to rivers, streams, lakes, or other open waters, which separates the open water from developed areas, including agricultural.

Wetlands: as defined in 33 CFR 328.2(b) "… those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

404(b)(1)Guidelines: Regulatory Guidelines for discharges of dredged or fill material implementing Section 404(b)(1) of the CWA. 40 CFR Part 230.

Appendix 3: Functional Assessment Methods

The following list of rapid lentic and lotic functional assessments is meant only to serve as a starting point for selecting an appropriate method. The list includes methods that may only be applicable to certain areas within the Louisville District.

Lotic Assessment Methods:

The Rosgen Stream Order Classification System
Rosgen, David, *Applied River Morphology*, Hilton Lee Silvey, 1996

The Strahler Order Classification System
Strahler, A.N. 1957. *Quantitative analysis of watershed geomorphology*. American Geophysical Union Transactions. 38: 913-920.

EPA Rapid Bioassessment Protocol (RBP)
Barbour, M.T., J. Gerritsen, B.D. Snyder, J.B. Stribling. 1999. *Rapid bioassessment protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates, and fish*, second edition. EPA 841-B-99-002. US EPA, Washington, DC.
http://www.epa.gov/owowwtr1/monitoring/rbp/

Eastern Kentucky Stream Assessment Protocol
http://www.lrl.usace.army.mil/orf/info/EKYStreamAssess/eastkystreamassessment.htm

Quality Habitat Evaluation Indices – to determine quality of streams (QHEI)
Ohio Environmental Protection Agency, Division of Surface Water, 401/Wetland Section, P.O. Box 1049, Columbus, Ohio 43266-0149

Index of Biotic Integrity
http://www.epa.gov/bioindicators/html/ibi-hist.html

Lentic Assessment Methods:

Ohio Rapid Assessment Method for Wetlands v. 5.0 (ORAM)
http://www.epa.state.oh.us/dsw/401

Hydrogeomorphic Approach (HGM)
Brinson, M. M. (1993). "*A hydrogeomorphic classification for wetlands*," Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A270 053. http://www.wes.army.mil/el/wetlands/hgmhp.html

Ainslie, W.B., Smith, R.D., Pruitt, B.A., Roberts, T.H., Sparks, E.J., West, L., Godshalk, G.L., and Miller, M.V. (1999). *"A Regional Guidebook for Assessing the Functions of Low Gradient,*

Riverine Wetlands in Western Kentucky," Technical Report WRP-DE-17, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. (pending). http://www.wes.army.mil/el/wetlands/pdfs/wrpde17/wrpde17.pdf

Wetland Evaluation Technique (WET)

Adamus Resource Assessment, Inc., 6028 NW Burgandy Dr., Corvallis, OR. 97330 (503) 745-7092

Floristic Quality Assessment for Indiana

Rothrock, Paul E. (2004). *"Floristic Quality Assessment In Indiana: The Concept, Use, and Development of Coefficients of Conservatisim"***,** Indiana Department of Environmental Management. http://www.in.gov/idem/water/planbr/401/publications.html

Appendix 4: Cowardin Classification: http://www.npwrc.usgs.gov/resource/1998/classwet/classwet.htm

WETLANDS AND DEEPWATER HABITATS CLASSIFICATION

SYSTEM: L — LACUSTRINE

SUBSYSTEM: 1 — LIMNETIC; 2 — LITTORAL

CLASS	Subclass
1 — LIMNETIC: RB — ROCK BOTTOM	1 Bedrock; 2 Rubble
1 — LIMNETIC: UB — UNCONSOLIDATED BOTTOM	1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic
1 — LIMNETIC: AB — AQUATIC BED	1 Algal; 2 Aquatic Moss; 3 Rooted Vascular; 4 Floating Vascular; 5 *Unknown Submergent*; 6 *Unknown Surface*
1 — LIMNETIC: OW — *OPEN WATER/ Unknown Bottom*	
2 — LITTORAL: RB — ROCK BOTTOM	1 Bedrock; 2 Rubble
2 — LITTORAL: UB — UNCONSOLIDATED BOTTOM	1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic
2 — LITTORAL: AB — AQUATIC BED	1 Algal; 2 Aquatic Moss; 3 Rooted Vascular; 4 Floating Vascular; 5 *Unknown Submergent*; 6 *Unknown Surface*
2 — LITTORAL: RS — ROCKY SHORE	1 Bedrock; 2 Rubble
2 — LITTORAL: US — UNCONSOLIDATED SHORE	1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic; 5 Vegetated
2 — LITTORAL: EM — EMERGENT	2 Nonpersistent
2 — LITTORAL: OW — *OPEN WATER/ Unknown Bottom*	

SYSTEM: P — PALUSTRINE

CLASS	Subclass
RB — ROCK BOTTOM	1 Bedrock; 2 Rubble
UB — UNCONSOLIDATED BOTTOM	1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic
AB — AQUATIC BED	1 Algal; 2 Aquatic Moss; 3 Rooted Vascular; 4 Floating Vascular; 5 *Unknown Submergent*; 6 *Unknown Surface*
US — UNCONSOLIDATED SHORE	1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic; 5 Vegetated
ML — MOSS-LICHEN	1 Moss; 2 Lichen
EM — EMERGENT	1 Persistent; 2 Nonpersistent
SS — SCRUB-SHRUB	1 Broad-Leaved Deciduous; 2 Needle-Leaved Deciduous; 3 Broad-Leaved Evergreen; 4 Needle-Leaved Evergreen; 5 Dead; 6 *Deciduous*; 7 *Evergreen*
FO — FORESTED	1 Broad-Leaved Deciduous; 2 Needle-Leaved Deciduous; 3 Broad-Leaved Evergreen; 4 Needle-Leaved Evergreen; 5 Dead; 6 *Deciduous*; 7 *Evergreen*
OW — *OPEN WATER/ Unknown Bottom*	

MODIFIERS

In order to more adequately describe wetland and deepwater habitats one or more of the water regime, water chemistry, soil, or special modifiers may be applied at the class or lower level in the hierarchy. The farmed modifier may also be applied to the ecological system.

WATER REGIME

Non-Tidal

- A Temporarily Flooded
- B Saturated
- C Seasonally Flooded
- D *Seasonally Flooded/ Well Drained*
- E *Seasonally Flooded/ Saturated*
- F Semipermanently Flooded
- G Intermittently Exposed
- H Permanently Flooded
- J Intermittently Flooded
- K Artificially Flooded
- W Intermittently Flooded/Temporary
- Y Saturated/Semipermanent/ Seasonal
- Z Intermittently Exposed/Permanent
- U *Unknown*

Tidal

- K *Artificially Flooded*
- L Subtidal
- M Irregularly Exposed
- N Regularly Flooded
- P Irregularly Flooded
- *S Temporary-Tidal
- *R Seasonal-Tidal
- *T Semipermanent-Tidal
- *V Permanent-Tidal
- U *Unknown*

*These water regimes are only used in tidally influenced, freshwater systems.

WATER CHEMISTRY

Coastal Halinity

- 1 Hyperhaline
- 2 Euhaline
- 3 Mixohaline *(Brackish)*
- 4 Polyhaline
- 5 Mesohaline
- 6 Oligohaline
- 0 Fresh

Inland Salinity

- 7 Hypersaline
- 8 Eusaline
- 9 Mixosaline
- 0 Fresh

pH Modifiers for all Fresh Water

- a Acid
- t Circumneutral
- i Alkaline

SOIL

- g Organic
- n Mineral

SPECIAL MODIFIERS

- b *Beaver*
- d *Partially Drained/Ditched*
- f Farmed
- h *Diked/Impounded*
- r Artificial Substrate
- s *Spoil*
- x Excavated

Appendix 5: Louisville District Mitigation Plan Checklist

Baseline Information for Impact and Proposed Mitigation Sites

- ❑ Summary of Project Impacts/Purpose and Mitigation Concept/Purpose
- ❑ Detailed location information
- ❑ Relative geographic location within USGS 8-digit watershed
- ❑ Surrounding Land Use
- ❑ Classification
- ❑ Existing Conditions: Landscape Setting/Ecosystem Context
- ❑ Field Observations
- ❑ Climate
- ❑ Water Quality
- ❑ Functional Assessment Tool
- ❑ Site maps
- ❑ Aerial Photography, if available
- ❑ USDA/NRCS County Soil survey sheet for site
- ❑ Photographs of the site with a corresponding photo orientation map
- ❑ Responsible parties

Goals & Objectives of the Proposed Mitigation

- ❑ Functions & Values (Existing, predicted, and Watershed Context)
- ❑ Methodology for Measurement
- ❑ Analyze debits/credits (Acreage/Linear Feet & Functional Capacity Units)
- ❑ Discuss functional replacement (In-Kind vs. Out-of-Kind, Holistic Aquatic Ecosystem Context & Watershed/Landscape Context)
- ❑ Identify potential mitigation challenges
- ❑ Provide a written narrative of environmental goals and objectives

Mitigation Work/Implementation Plan

- ❑ Describe site preparation (Discuss Site Plans, Soils/Substrate, Hydrology, Planting Plan, Exotic & Undesirable Species Control, Schedule & Construction Monitoring)
- ❑ As-Built Conditions
- ❑ Financial Assurances

Success Criteria

- ❑ Identify minimum and project specific success criteria
- ❑ Include measurable performance standards
- ❑ Assess how performance standards support the goals and objectives

Monitoring

- ❑ Provide monitoring schedule, responsible party (ies)
- ❑ Specify data to be collected, including assessment tools and methodologies
- ❑ Identify proposed method of site protection (conservation easement, deed restriction)

Contingency Plan

- ❑ Discuss the steps to be taken in the event that the success criteria have not been met
- ❑ Indicate course of action to be taken in the event that the Corps determines the compensatory mitigation cannot be successfully achieved at the intended site.

Appendix 6: Regulatory Guidance Letter No. 02-2

US Army Corps of Engineers®

REGULATORY GUIDANCE LETTER

No. 02-2 **Date:** December 24, 2002

SUBJECT: Guidance on Compensatory Mitigation Projects for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899

1. Purpose and Applicability:

a. Purpose: Under existing law the Corps requires compensatory mitigation to replace aquatic resource functions unavoidably lost or adversely affected by authorized activities. This Regulatory Guidance Letter (RGL) clarifies and supports the national policy for "no overall net loss" of wetlands and reinforces the Corps commitment to protect waters of the United States, including wetlands. Permittees must provide appropriate and practicable mitigation for authorized impacts to aquatic resources in accordance with the laws and regulations. Relevant laws, regulations, and guidance are listed in Appendix A. This guidance does not modify existing mitigation policies, regulations, or guidance. However, it does supersede RGL 01-1 that was issued October 31, 2001. Districts will consider the requirements of other Federal programs when implementing this guidance.

b. Applicability: This guidance applies to all compensatory mitigation proposals associated with permit applications submitted for approval after this date.

2. General Considerations: Districts will use watershed and ecosystem approaches when determining compensatory mitigation requirements, consider the resource needs of the watersheds where impacts will occur, and also consider the resource needs of neighboring watersheds. When evaluating compensatory mitigation plans, Districts should consider the operational guidelines developed by the National Research Council (2001) for creating or restoring ecologically self-sustaining wetlands. These operational guidelines, which are in Appendix B, will be provided to applicants who must implement compensatory mitigation projects.

a. Watershed Approach: A watershed-based approach to aquatic resource protection considers entire systems and their constituent parts. Districts will recognize the authorities of, and rely on the expertise of, tribal, state, local, and other Federal resource management programs. During the permit evaluation process, Districts will coordinate with these entities and take into account zoning regulations, regional council and metropolitan planning organization

initiatives, special area management planning initiatives, and other factors of local public interest. Watersheds will be identified, for accounting purposes, using the U.S. Geologic Survey's Hydrologic Unit Codes. Finally, applicants will be encouraged to provide compensatory mitigation projects that include a mix of habitats such as open water, wetlands, and adjacent uplands. When viewed from a watershed perspective, such projects often provide a greater variety of functions.

b. Consistency and Compatibility. Districts will coordinate proposed mitigation plans with tribes, states, local governments, and other Federal agencies consistent with existing laws, regulation, and policy guidance to ensure that applicants' mitigation plans are consistent with watershed needs and compatible with adjacent land uses. Districts will evaluate applicants' mitigation proposals giving full consideration to comments and recommendations from tribes, states, local governments, and other Federal agencies. Districts may coordinate on a case-by-case basis during the application evaluation process, or on programmatic basis to promote consistent and timely decision-making.

c. Impacts and Compensation: Army regulations require appropriate and practicable compensatory mitigation to replace functional losses to aquatic resources, including wetlands. Districts will determine what level of mitigation is "appropriate" based upon the functions lost or adversely affected as a result of impacts to aquatic resources. When determining "practicability," Districts will consider the availability of suitable locations, constructibility, overall costs, technical requirements, and logistics. There may be instances where permit decisions do not meet the "no overall net loss of wetlands" goal because compensatory mitigation would be impracticable, or would only achieve inconsequential reductions in impacts. Consequently, the "no overall net loss of wetlands goal" may not be achieved for each and every permit action, although all Districts will strive to achieve this goal on a cumulative basis, and the Corps will achieve the goal programmatically.

d. Measuring Impacts and Compensatory Mitigation. The Corps has traditionally used acres as the standard measure for determining impacts and required mitigation for wetlands and other aquatic resources, primarily because useful functional assessment methods were not available. However, Districts are encouraged to increase their reliance on functional assessment methods. Districts will determine, on a case-by-case basis, whether to use a functional assessment or acreage surrogates for determining mitigation and for describing authorized impacts. Districts will use the same approach to determine losses (debits) and gains (credits) in terms of amounts, types, and location(s) for describing both impacts and compensatory mitigation.

1. **Functional Assessment**: The objective is to offset environmental losses resulting from authorized activities. The ecological characteristics of aquatic sites are unique. Therefore, when possible, Districts should use a functional assessment by qualified professionals to determine impacts and compensatory mitigation requirements. Districts should determine functional scores using aquatic site assessment techniques generally accepted by experts in the field or the best professional judgment of Federal, tribal, and state agency representatives, fully considering ecological functions included in the 404 (b)(1) Guidelines. When a District uses a functional

assessment method, e.g., a Hydrogeomorphic Assessment or Wetland Rapid Assessment Procedure, the District will make the method available to applicants for planning mitigation.

2. **Functional Replacement**: For wetlands, the objective is to provide, at a minimum, one-to-one functional replacement, i.e., no net loss of functions, with an adequate margin of safety to reflect anticipated success. Focusing on the replacement of the functions provided by a wetland, rather than only calculation of acreage impacted or restored, will in most cases provide a more accurate and effective way to achieve the environmental performance objectives of the no net loss policy. In some cases, replacing the functions provided by one wetland area can be achieved by another, smaller wetland; in other cases, a larger replacement wetland may be needed to replace the functions of the wetland impacted by development. Thus, for example, on an acreage basis, the ratio should be greater than one-to-one where the impacted functions are demonstrably high and the replacement wetlands are of lower function. Conversely, the ratio may be less than one-to-one where the functions associated with the area being impacted are demonstrably low and the replacement wetlands are of higher function.

3. **Functional Changes**: Districts may account for functional changes by recording them as site-specific debits and credits as defined below.

> **a.) Credit:** A unit of measure, e.g., a functional capacity unit in the Hydrogeomorphic Assessment Method, representing the gain of aquatic function at a compensatory mitigation site; the measure of function is typically indexed to the number of acres of resource restored, established, enhanced, or protected as compensatory mitigation.
>
> **b.) Debit:** A unit of measure, e.g., a functional capacity unit in the Hydrogeomorphic Assessment Method, representing the loss of aquatic function at a project site; the measure of function is typically indexed to the number of acres impacted by issuance of the permit.

4. **Acreage Surrogate:** In the absence of more definitive information on the functions of a specific wetland site, a minimum one-to-one acreage replacement may be used as a reasonable surrogate for no net loss of functions. For example, information on functions might be lacking for enforcement actions that generate after-the-fact permits or when there is no appropriate method to evaluate functions. When Districts require one-to-one acreage replacement, they will inform applicants of specific amounts and types of required mitigation. Districts will provide rationales for acreage replacement and identify the factors considered when the required mitigation differs from the one-to-one acreage surrogate.

5. **Streams**. Districts should require compensatory mitigation projects for streams to replace stream functions where sufficient functional assessment is feasible. However, where functional assessment is not practical, mitigation projects for streams should generally replace linear feet of stream on a one-to-one basis. Districts will evaluate such surrogate proposals carefully because experience has shown that stream compensation measures are not always practicable, constructible, or ecologically desirable.

e. Wetland Project Types: Although the following definitions were developed to characterize wetland projects, the principles they reflect may also be useful for decisions on other aquatic resource projects.

1. **Establishment (Creation):** The manipulation of the physical, chemical, or biological characteristics present to develop a wetland on an upland or deepwater site, where a wetland did not previously exist. Establishment results in a gain in wetland acres.

2. **Restoration:** The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural or historic functions to a former or degraded wetland. For the purpose of tracking net gains in wetland acres, restoration is divided into:

a.) Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural or historic functions to a former wetland. Re-establishment results in rebuilding a former wetland and results in a gain in wetland acres.

b.) Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural or historic functions of a degraded wetland. Rehabilitation results in a gain in wetland function but does not result in a gain in wetland acres.

3. **Enhancement:** The manipulation of the physical, chemical, or biological characteristics of a wetland (undisturbed or degraded) site to heighten, intensify, or improve specific function(s) or to change the growth stage or composition of the vegetation present. Enhancement is undertaken for specified purposes such as water quality improvement, flood water retention, or wildlife habitat. Enhancement results in a change in wetland function(s) and can lead to a decline in other wetland functions, but does not result in a gain in wetland acres. This term includes activities commonly associated with enhancement, management, manipulation, and directed alteration.

4. **Protection/Maintenance (Preservation):** The removal of a threat to, or preventing the decline of, wetland conditions by an action in or near a wetland. This term includes the purchase of land or easements, repairing water control structures or fences, or structural protection such as repairing a barrier island. This term also includes activities commonly associated with the term preservation. Preservation does not result in a gain of wetland acres and will be used only in exceptional circumstances.

f. Preservation Credit: Districts may give compensatory mitigation credit when existing wetlands, or other aquatic resources are preserved in conjunction with establishment, restoration, and enhancement activities. However, Districts should only consider credit when the preserved resources will augment the functions of newly established, restored, or enhanced aquatic resources. Such augmentation may be reflected in the amount of credit attributed to the entire mitigation project. In exceptional circumstances, the preservation of existing wetlands or other aquatic resources may be authorized as the sole basis for generating credits as mitigation projects. Natural wetlands provide numerous ecological benefits that restored wetlands cannot

provide immediately and may provide more practicable long-term ecological benefits. If preservation alone is proposed as mitigation, Districts will consider whether the wetlands or other aquatic resources: 1) perform important physical, chemical or biological functions, the protection and maintenance of which is important to the region where those aquatic resources are located; and, 2) are under demonstrable threat of loss or substantial degradation from human activities that might not otherwise be avoided. The existence of a demonstrable threat will be based on clear evidence of destructive land use changes that are consistent with local and regional (i.e., watershed) land use trends, and that are not the consequence of actions under the permit applicant's control.

g. On-site and Off-site Mitigation: Districts may require on-site, off-site, or a combination of on-site and off-site mitigation to maintain wetland functional levels within watersheds. Mitigation should be required, when practicable, in areas adjacent or contiguous to the discharge site (on-site compensatory mitigation). On-site mitigation generally compensates for locally important functions, e.g., local flood control functions or unusual wildlife habitat. However, off-site mitigation may be used when there is no practicable opportunity for on-site mitigation, or when off-site mitigation provides more watershed benefit than on-site mitigation, e.g., is of greater ecological importance to the region of impact. Off-site mitigation will be in the same geographic area, i.e., in close proximity to the authorized impacts and, to the extent practicable, in the same watershed. In choosing between on-site or off-site compensatory mitigation, Districts will consider: 1) likelihood for success; 2) ecological sustainability; 3) practicability of long-term monitoring and maintenance or operation and maintenance; and, 4) relative costs of mitigation alternatives.

h. In-kind and Out-of-kind Mitigation: Districts may require in-kind, out-of-kind, or a combination of in-kind and out-of-kind, compensatory mitigation to achieve functional replacement within surrounding watersheds. In-kind compensation for a wetland loss involves replacement of a wetland area by establishing, restoring, enhancing, or protecting and maintaining a wetland area of the same physical and functional type. In-kind replacement generally is required when the impacted resource is locally important. Out-of-kind compensation for a wetland loss involves replacement of a wetland area by establishing, restoring, enhancing, or protecting and maintaining an aquatic resource of different physical and functional type. Out-of-kind mitigation is appropriate when it is practicable and provides more environmental or watershed benefit than in-kind compensation (e.g., of greater ecological importance to the region of impact).

i. Buffers: Districts may require that compensatory mitigation for projects in wetlands or other aquatic resources include the establishment and maintenance of buffers to ensure that the overall mitigation project performs as expected. Buffers are upland or riparian areas that separate wetlands or other aquatic resources from developed areas and agricultural lands. Buffers typically consist of native plant communities (i.e., indigenous species) that reflect the local landscape and ecology. Buffers enhance or provide a variety of aquatic habitat functions including habitat for wildlife and other organisms, runoff filtration, moderation of water temperature changes, and detritus for aquatic food webs. Additional guidance regarding the appropriate use of buffers as a component of compensatory mitigation is forthcoming.

1. **Upland Areas:** Under limited circumstances, Districts may give credit for inclusion of upland areas within a compensatory mitigation project to the degree that the protection and management of such areas is an enhancement of aquatic functions and increases the overall ecological functioning of the mitigation site, or of other aquatic resources within the watershed (see Federal Mitigation Banking Guidance and Nationwide Permit General Condition 19). Such enhancement may be reflected in the amount of credit attributed to the mitigation project. Districts will evaluate and document the manner and extent to which upland areas augment the functions of wetland or other aquatic resources. The establishment of buffers in upland areas may only be authorized as mitigation if the District determines that this is best for the aquatic environment on a watershed basis. In making this determination, Districts will consider whether the wetlands or other aquatic resources being buffered: 1) perform important physical, chemical, or biological functions, the protection and maintenance of which is important to the region where those aquatic resources are located; and 2) are under demonstrable threat of loss or substantial degradation from human activities that might not otherwise be avoided.

2. **Riparian Areas:** Districts may give credit for inclusion of riparian areas within a compensatory mitigation project to the degree that the protection and management of such areas is an enhancement of aquatic functions and increases the overall ecological functioning of the mitigation site, or of other aquatic resources within the watershed. Such enhancement may be reflected in the amount of credit attributed to the mitigation project. Districts will evaluate and document the manner and extent to which riparian areas augment the functions of streams or other aquatic resources. The establishment of buffers in riparian areas may only be authorized as mitigation if the District determines that this is best for the aquatic environment on a watershed basis. In making this determination, Districts will consider whether the streams or other aquatic resources being buffered: 1) perform important physical, chemical, or biological functions, the protection and maintenance of which is important to the region where those aquatic resources are located; and 2) are under demonstrable threat of loss or substantial degradation from human activities that might not otherwise be avoided.

j. Compensatory Mitigation Alternatives: Permit applicants may propose the use of mitigation banks, in-lieu fee arrangements, or separate activity-specific projects.

k. Public Review and Comment:

1. **Individual Permits**: Proposed compensatory mitigation will be made available for public review and comment, consistent with the form (mitigation bank, in-lieu fee arrangement, or separate activity-specific compensatory mitigation project) of proposed compensation. Although, as a matter of regulation at 33 CFR 325.1 (d)(9), compensatory mitigation plans are not required before the Corps can issue a public notice, Districts should encourage applicants, during pre-application consultation, to provide mitigation plans with applications to facilitate timely and effective review. Public Notices should indicate the form of proposed compensatory mitigation and include information on components of the compensatory mitigation plan. If mitigation plans are available, synopses may be included in Public Notices and the complete plans made available for inspection at District offices. If mitigation plans are available and reproducible, Districts will forward copies to Federal, tribal, and state resource agencies. Districts should not delay issuing Public Notices when mitigation plans are not submitted with otherwise complete applications proposing impacts to aquatic resources.

2. **General Permits**: Requests for nationwide and regional general permit verifications are not subject to public notice and comment. However, general permit compensatory mitigation provisions or requirements are published for public comment at the time general permits are proposed for issuance or reissuance. Additional review of case-specific mitigation plans should be consistent with the conditions of the Nationwide or Regional Permit. Public review and comment should be provided for proposed mitigation banks and in-lieu-fee arrangements consistent with the Banking Guidance and In-lieu-fee Guidance provisions.

l. Permit Special Conditions: Districts will include in individual permits, and general permit verifications that contain a wetland compensatory mitigation requirement, special conditions that identify: 1) the party(s) responsible for meeting any or all components of compensatory mitigation requirements; 2) performance standards for determining compliance; and, 3) other requirements such as financial assurances, real estate assurances, monitoring programs, and the provisions for short and long-term maintenance of the mitigation site. Special conditions may include, by reference, the compensatory mitigation plan, monitoring requirements and a contingency mitigation plan. Permittees are responsible for assuring that activity-specific compensatory mitigation projects are implemented successfully and protected over the long-term. If mitigation banks or in-lieu fee arrangements are used to provide the mitigation, the party(s) identified as responsible for administering those facets of the bank or the in-lieu fee arrangement become liable for implementation and performance.

m. Timing of Mitigation Construction: Construction should be concurrent with authorized impacts to the extent practicable. Advance or concurrent mitigation can reduce temporal losses of aquatic functions and facilitate compliance. In some circumstances it may be acceptable to allow impacts to aquatic resources to occur before accomplishing compensatory mitigation, for example, in cases where construction of the authorized activity would disturb or harm on site compensatory mitigation work or where a simple restoration project is required. Some Federal-aid highway projects have legal and contractual requirements regarding the timing of mitigation that conflict with the policy to accomplish advance or concurrent mitigation. For compensatory mitigation involving in-lieu-fee arrangements or mitigation banks, the guidance applicable to those forms of mitigation should be followed with respect to timing of mitigation site development. After-the-fact mitigation may also be required for permits issued in emergencies or from an enforcement action.

n. Compensatory Mitigation Accomplished After Overall Project Construction: In general, when impacts to aquatic resources are authorized before mitigation is initiated, Districts will require: 1) a Corps-approved mitigation plan; 2) a secured mitigation project site; 3) appropriate financial assurances in place; and, 4) legally protected, adequate water rights where necessary. Initial physical and biological improvements in the mitigation plan generally should be completed no later than the first full growing season following the impacts from authorized activities. If beginning the initial improvements within that time frame is not practicable, then other measures that mitigate for the consequences of temporal losses should be included in the mitigation plan.

o. General Permits: For activities authorized by general permits, Districts may recommend consolidated compensatory mitigation projects such as mitigation banks and in-lieu

fee programs where such sources of compensatory mitigation are available. Consolidated mitigation facilitates a watershed approach to mitigating impacts to waters of the United States. For regional general permits associated with Special Area Management Plans or other types of watershed plans, the District may also recommend the use of mitigation banks or in-lieu-fee arrangements, consistent with the guidance for those forms of compensation.

3. Compensatory Mitigation Plans: Districts will strive to discuss compensatory mitigation proposals with applicants during pre-application consultation. If this does not occur, the scope and specificity of proposed compensatory mitigation plans merely represent the applicant's view of what is necessary, a view that may not be acceptable to the Corps or other governmental authorities. At the earliest opportunity, Districts will advise applicants of the mitigation sequencing requirements of the Section 404(b)(1) Guidelines, or what is required for general permits. Compensation is the last step in the sequencing requirements of the Section 404 (b)(1) Guidelines. Thus, for standard permit applications, Districts should not require detailed compensatory mitigation plans until they have established the unavoidable impact. In all circumstances, the level of information provided regarding mitigation should be commensurate with the potential impact to aquatic resources, consistent with the guidance from Regulatory Guidance Letter 93-2 on the appropriate level of analysis for compliance with the Section 404 (b)(1) Guidelines. Districts will identify for applicants the pertinent factors for this determination (e.g., watershed considerations, local or state requirements, uncertainty, out-of-kind compensation, protection and maintenance requirements, etc.). Districts also will identify for applicants the rationale to be used (e.g., best professional judgment, Hydrogeomorphic Assessment Method, Wetland Rapid Assessment Procedure, etc.) for determining allowable impact and required compensatory mitigation. Applicants will be encouraged to submit appropriate compensatory mitigation proposals with individual permit applications or general permit pre-construction notices. The components listed below form the basis for development of compensatory mitigation plans.

a. Baseline Information: As part of the permit decision Districts will include approved, written compensatory mitigation plans describing the location, size, type, functions and amount of impact to aquatic and other resources, as well as the resources in the mitigation project. In addition, they should describe the size, e.g., acreage of wetlands, length and width of streams, elevations of existing ground at the mitigation site, historic and existing hydrology, stream substrate and soil conditions, and timing of the mitigation. Baseline information may include quantitative sampling data on the physical, chemical, and biological characteristics of the aquatic resources at both the proposed mitigation site and the impact site. This documentation will support the compensatory mitigation requirement.

b. Goals and Objectives: Compensatory mitigation plans should discuss environmental goals and objectives, the aquatic resource type(s), e.g., hydrogeomorphic (HGM) regional wetland subclass, Rosgen stream type, Cowardin classification, and functions that will be impacted by the authorized work, and the aquatic resource type(s) and functions proposed at the compensatory mitigation site(s). For example, for impacts to tidal fringe wetlands the mitigation goal may be to replace lost finfish and shellfish habitat, lost estuarine habitat, or lost water quality functions associated with tidal backwater flooding. The objective statement should describe the amount, i.e., acres, linear feet, or functional changes, of aquatic habitat that the

authorized work will impact and the amount of compensatory mitigation needed to offset those impacts, by aquatic resource type.

c. Site Selection: Compensatory mitigation plans should describe the factors considered during the site selection process and plan formulation including, but not limited to:

1. **Watershed Considerations:** Mitigation plans should describe how the site chosen for a mitigation project contributes to the specific aquatic resource needs of the impacted watershed. A compensatory mitigation project generally should be in the same watershed. The further removed geographically that the mitigation is, the greater is the need to demonstrate that the proposed mitigation will reasonably offset authorized impacts.

2. **Practicability:** The mitigation plan should describe site selection in terms of cost, existing technology, and logistics.

3. **Air Traffic:** Compensatory mitigation projects that have the potential to attract waterfowl and other bird species that might pose a threat to aircraft will be sited consistent with the Federal Aviation Administration Advisory Circular on Hazardous Wildlife Attractants on or near Airports (AC No: 150/5200-33, 5/1/97).

d. Mitigation Work Plan: Compensatory mitigation work plans should contain written specifications and work descriptions, including, but not limited to: 1) boundaries of proposed restoration, establishment, enhancement, or preserved areas (e.g., maps and drawings); 2) construction methods, timing and sequence; 3) source of water supply and connections to existing waters and proximity to uplands; 4) native vegetation proposed for planting; 5) allowances for natural regeneration from an existing seed bank or planting; 6) plans for control of exotic invasive vegetation; 7) elevation(s) and slope(s) of the proposed mitigation area to ensure they conform with required elevation and hydrologic requirements, if practicable, for target plant species; 8) erosion control measures; 9) stream or other open water geomorphology and features such as riffles and pools, bends, deflectors, etc.; and 10) a plan outlining site management and maintenance.

e. Performance Standards: Compensatory mitigation plans will contain written performance standards for assessing whether mitigation is achieving planned goals. Performance standards will become part of individual permits as special conditions and be used for performance monitoring. Project performance evaluations will be performed by the Corps, as specified in the permits or special conditions, based upon monitoring reports. Adaptive management activities may be required to adjust to unforeseen or changing circumstances, and responsible parties may be required to adjust mitigation projects or rectify deficiencies. The project performance evaluations will be used to determine whether the environmental benefits or "credit(s)" for the entire project equal or exceed the environmental impact(s) or "debit(s)" of authorized activities. Performance standards for compensatory mitigation sites will be based on quantitative or qualitative characteristics that can be practicably measured. The performance standards will be indicators that demonstrate that the mitigation is developing or has developed into the desired habitat. Performance standards will vary by geographic region and aquatic habitat type, and may be developed through interagency coordination at the regional level.

Performance standards for wetlands can be derived from the criteria in the 1987 Corps of Engineers Wetlands Delineation Manual, such as the duration of soil saturation required to meet the wetland hydrology criterion, or variables and associated functional capacity indices in hydrogeomorphic assessment method regional guidebooks. Performance standards may also be based on reference wetlands.

f. Project Success: Compensatory mitigation plans will identify all parties responsible for compliance with the mitigation plan and their role in the mitigation project. The special conditions for the permit will identify these responsibilities as required above. Restoration projects provide the greatest potential for success in terms of functional compensation; however, each type has utility and may be used for compensatory mitigation.

g. Site Protection: Compensatory mitigation plans should include a written description of the legal means for protecting mitigation area(s), and permits will be conditioned accordingly. The wetlands, uplands, riparian areas, or other aquatic resources in a mitigation project should be permanently protected, in most cases, with appropriate real estate instruments, e.g., conservation easements, deed restrictions, transfer of title to Federal or state resource agencies or non-profit conservation organizations. Generally, conservation easements held by tribal, state or local governments, other Federal agencies, or non-governmental groups, such as land trusts, are preferable to deed restrictions. Homeowners' associations should be used for these purposes only in exceptional circumstances, such as when the association is responsible for community open spaces with restrictive covenants. Districts may require third party monitoring if necessary to ensure permanent protection. In no case will the real estate instrument require a Corps official's signature. Also, Districts will not approve a requirement that results in the Federal government holding deed restrictions on properties, or that contains real estate provisions committing Corps Districts to any interest in the property in question, unless proper statutory authority is identified that authorizes such an arrangement.

h. Contingency Plan: Compensatory mitigation plans should include contingency plans for unanticipated site conditions or changes. For example, contingency plans may identify financial assurance mechanisms that could be used to implement remedial measures to correct unexpected problems. Additionally, contingency plans will allow for modifications to performance standards if mitigation projects are meeting compensatory mitigation goals, but in unanticipated ways. Finally, contingency plans could address the circumstances that might result in no enforcement or remedial action if forces beyond the control of responsible parties adversely impact mitigation sites. In any case, Districts will determine the course of action to be taken in the event of unexpected conditions based on the goals and objectives for the mitigation project, the performance standards, and the provisions of the contingency plan.

i. Monitoring and Long-term Management: Compensatory mitigation plans will identify the party(s) responsible for accomplishing, maintaining, and monitoring the mitigation. Districts will require monitoring plans with a reporting frequency sufficient for an inspector to determine compliance with performance standards and to identify remedial action. Monitoring will be required for an adequate period of time, normally 5 to 10 years, to ensure the project meets performance standards. Corps permits will require permanent compensatory mitigation

unless otherwise noted in the special conditions of the permit. Districts may take enforcement action even after the identified monitoring period, if there has been a violation.

j. Financial Assurances: Compensatory mitigation plans will identify the party responsible for providing and managing any financial assurances and contingency funds set aside for remedial measures to ensure mitigation success. This includes identifying the party that will provide for long-term management and protection of the mitigation project. Financial assurances should be commensurate with the level of impact and the level of compensatory mitigation required. Permit conditions for minimal and low impact projects are generally sufficient for enforcing performance standards and requiring compliance, without the requirement of additional financial assurances. Financial assurances should be sufficient to cover contingency actions such as a default by the responsible party, or a failure to meet performance standards. District Engineers will generally emphasize financial assurances when the authorized impacts occur prior to successful completion of the mitigation, to include the monitoring period. Financial assurances may be in the form of performance bonds, irrevocable trusts, escrow accounts, casualty insurance, letters of credit, legislatively enacted dedicated funds for government operated banks or other approved instruments. Such assurances may be phased-out or reduced, once the project has been demonstrated functionally mature and self-sustaining in accordance with performance standards.

Financial assurances for third party mitigation should be consistent with existing guidance (e.g., Federal Guidance for the Establishment, Use and Operation of Mitigation Banks, and the Federal Guidance on the Use of In-Lieu-Fee Arrangements for Compensatory Mitigation under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act). The District will determine project success, and the need to use financial assurances to carry out remedial measures, in accordance with the project performance standards.

4. <u>Duration</u>. This guidance remains effective unless revised or rescinded.

FOR THE COMMANDER:

Encl

ROBERT H. GRIFFIN
Major General, U.S. Army
Director of Civil Works

Appendix A: Authorities (for Regulatory Guidance Letter No. 02-2)

This RGL is issued in accordance with the following statutes, regulations, and policies. It is intended to clarify provisions within these existing authorities and does not establish new requirements.

a. Clean Water Act Section 404 [33 USC 1344].

b. Rivers and Harbors Act of 1899 Section 10 [33 USC 403 et seq.].

c. Environmental Protection Agency, Section 404(b)(1) Guidelines [40 CFR Part 230]. Guidelines for Specification of Disposal Sites for Dredged or Fill Material.

d. Department of the Army, Section 404 Permit Regulations [33 CFR Parts 320-331]. Policies for evaluating permit applications to discharge dredged or fill material.

e. Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines [February 6, 1990].

f. Federal Guidance for the Establishment, Use, and Operation of Mitigation Banks [November 28, 1995].

g. Federal Guidance on the Use of In-Lieu-Fee Arrangements for Compensatory Mitigation under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act [November 7, 2000]

h. Title XII of the Food Security Act of 1985 as amended by the Farm Security and Rural Investment Act of 2002 [16 USC 3801 et seq.].

i. National Environmental Policy Act [42 USC 4321 et seq.], including the Council on Environmental Quality's implementing regulations [40 CFR Parts 1500-1508].

j. Fish and Wildlife Coordination Act [16 USC 661 et seq.].

k. Fish and Wildlife Service Mitigation Policy [46 FR pages 7644-7663, 1981].

l. Magnuson Fishery Conservation and Management Act [16 USC 1801 et seq.].

m. National Marine Fisheries Service Habitat Conservation Policy [48 FR pages 53142-53147, 1983].

n. The Transportation Equity Act for the 21st Century (TEA-21)

o. Federal Aviation Administration Advisory Circular on Hazardous Wildlife Attracts on or near Airports (AC No: 150/5200-33, 5/1/97)

p. Endangered Species Act of 1973, as amended [16 U.S.C. 1531 et seq.]

q. Migratory Bird Treaty Act [16 U.S.C. 703 et seq.]

r. Issuance of Nationwide Permits [67 FR 2020-2095, January 15, 2002]

Appendix B (for Regulatory Guidance Letter No. 02-2)

Taken from ***Operational Guidelines for Creating or Restoring Self-Sustaining Wetlands,*** **National Research Council 'Compensating for Wetland Losses Under The Clean Water Act,' June 2001** (Chapter 7, pp. 123-128).

1. Consider the hydrogeomorphic and ecological landscape and climate. Whenever possible locate the mitigation site in a setting of comparable landscape position and hydrogeomorphic class. Do not generate atypical "hydrogeomorphic hybrids"; instead, duplicate the features of reference wetlands or enhance connectivity with natural upland landscape elements (Gwin et al. 1999).

Regulatory agency personnel should provide a landscape setting characterization of both the wetland to be developed and, using comparable descriptors, the proposed mitigation site. Consider conducting a cumulative impact analysis at the landscape level based on templates for wetland development (Bedford 1999). Landscapes have natural patterns that maximize the value and function of individual habitats. For example, isolated wetlands function in ways that are quite different from wetlands adjacent to rivers. A forested wetland island, created in an otherwise grassy or agricultural landscape, will support species that are different from those in a forested wetland in a large forest tract. For wildlife and fisheries enhancement, determine if the wetland site is along ecological corridors such as migratory flyways or spawning runs. Constraints also include landscape factors. Shoreline and coastal wetlands adjacent to heavy wave action have historically high erosion rates or highly erodible soils, and often heavy boat wakes. Placement of wetlands in these locations may require shoreline armoring and other protective engineered structures that are contrary to the mitigation goals and at cross-purposes to the desired functions

Even though catastrophic events cannot be prevented, a fundamental factor in mitigation plan design should be how well the site will respond to natural disturbances that are likely to occur. Floods, droughts, muskrats, geese, and storms are expected natural disturbances and should be accommodated in mitigation designs rather than feared. Natural ecosystems generally recover rapidly from natural disturbances to which they are adapted. The design should aim to restore a series of natural processes at the mitigation sites to ensure that resilience will have been achieved.

2. Adopt a dynamic landscape perspective. Consider both current and future watershed hydrology and wetland location. Take into account surrounding land use and future plans for the land. Select sites that are, and will continue to be, resistant to disturbance from the surrounding landscape, such as preserving large buffers and connectivity to other wetlands. Build on existing wetland and upland systems. If possible, locate the mitigation site to take advantage of refuges, buffers, green spaces, and other preserved elements of the landscape. Design a system that utilizes natural processes and energies, such as the potential energy of streams as natural subsidies to the system. Flooding rivers and tides transport great quantities of water, nutrients, and organic matter in relatively short time periods, subsidizing the wetlands open to these flows as well as the adjacent rivers, lakes, and estuaries.

3. *Restore or develop naturally variable hydrological conditions.* Promote naturally variable hydrology, with emphasis on enabling fluctuations in water flow and level, and duration and frequency of change, representative of other comparable wetlands in the same landscape setting. Preferably, natural hydrology should be allowed to become reestablished rather than finessed through active engineering devices to mimic a natural hydroperiod. When restoration is not an option, favor the use of passive devices that have a higher likelihood to sustain the desired hydroperiod over long term. Try to avoid designing a system dependent on water-control structures or other artificial infrastructure that must be maintained in perpetuity in order for wetland hydrology to meet the specified design. In situations where direct (in-kind) replacement is desired, candidate mitigation sites should have the same basic hydrological attributes as the impacted site.

Hydrology should be inspected during flood seasons and heavy rains, and the annual and extreme-event flooding histories of the site should be reviewed as closely as possible. A detailed hydrological study of the site should be undertaken, including a determination of the potential interaction of groundwater with the proposed wetland. Without flooding or saturated soils, for at least part of the growing season, a wetland will not develop. Similarly, a site that is too wet will not support the desired biodiversity. The tidal cycle and stages are important to the hydrology of coastal wetlands.

4. *Whenever possible, choose wetland restoration over creation.* Select sites where wetlands previously existed or where nearby wetlands still exist. Restoration of wetlands has been observed to be more feasible and sustainable than creation of wetlands. In restored sites the proper substrate may be present, seed sources may be on-site or nearby, and the appropriate hydrological conditions may exist or may be more easily restored.

The U.S. Army Corps of Engineers (Corps) and Environmental Protection Agency (EPA) Mitigation Memorandum of Agreement states that, “because the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, restoration should be the first option considered” (Fed. Regist. 60(Nov. 28):58605). The Florida Department of Environmental Regulation (FDER 1991a) recommends an emphasis on restoration first, then enhancement, and, finally, creation as a last resort. Morgan and Roberts (1999) recommend encouraging the use of more restoration and less creation.

5. *Avoid over-engineered structures in the wetland's design.* Design the system for minimal maintenance. Set initial conditions and let the system develop. Natural systems should be planned to accommodate biological systems. The system of plants, animals, microbes, substrate, and water flows should be developed for self-maintenance and self-design. Whenever possible, avoid manipulating wetland processes using approaches that require continual maintenance. Avoid hydraulic control structures and other engineered structures that are vulnerable to chronic failure and require maintenance and replacement. If necessary to design in structures, such as to prevent erosion until the wetland has developed soil stability, do so using natural features, such as large woody debris. Be aware that more specific habitat designs and planting will be required where rare and endangered species are among the specific restoration targets.

Whenever feasible, use natural recruitment sources for more resilient vegetation establishment. Some systems, especially estuarine wetlands, are rapidly colonized, and natural recruitment is often equivalent or superior to plantings (Dawe et al. 2000). Try to take advantage of native seed banks, and use soil and plant material salvage whenever possible. Consider planting mature plants as supplemental rather than required, with the decision depending on early results from natural recruitment and invasive species occurrence. Evaluate on-site and nearby seed banks to ascertain their viability and response to hydrological conditions. When plant introduction is necessary to promote soil stability and prevent invasive species, the vegetation selected must be appropriate to the site rather than forced to fit external pressures for an ancillary purpose (e.g., preferred wildlife food source or habitat).

6. *Pay particular attention to appropriate planting elevation, depth, soil type, and seasonal timing.* When the introduction of species is necessary, select appropriate genotypes. Genetic differences within species can affect wetland restoration outcomes, as found by Seliskar (1995), who planted cordgrass (*Spartina alterniflora*) from Georgia, Delaware, and Massachusetts into a tidal wetland restoration site in Delaware. Different genotypes displayed differences in stem density, stem height, below-ground biomass, rooting depth, decomposition rate, and carbohydrate allocation. Beneath the plantings, there were differences in edaphic chlorophyll and invertebrates.

Many sites are deemed compliant once the vegetation community becomes established. If a site is still being irrigated or recently stopped being irrigated, the vegetation might not survive. In other cases, plants that are dependent on surface-water input might not have developed deep root systems. When the surface-water input is stopped, the plants decline and eventually die, leaving the mitigation site in poor condition after the Corps has certified the project as compliant.

7. Provide appropriately heterogeneous topography. The need to promote specific hydroperiods to support specific wetland plants and animals means that appropriate elevations and topographic variations must be present in restoration and creation sites. Slight differences in topography (e.g., micro- and meso-scale variations and presence and absence of drainage connections) can alter the timing, frequency, amplitude, and duration of inundation. In the case of some less-studied, restored wetland types, there is little scientific or technical information on natural microtopography (e.g., what causes strings and flarks in patterned fens or how hummocks in fens control local nutrient dynamics and species assemblages and subsurface hydrology are poorly known). In all cases, but especially those with minimal scientific and technical background, the proposed development wetland or appropriate example(s) of the target wetland type should provide a model template for incorporating microtopography.

Plan for elevations that are appropriate to plant and animal communities that are reflected in adjacent or close-by natural systems. In tidal systems, be aware of local variations in tidal flooding regime (e.g., due to freshwater flow and local controls on circulation) that might affect flooding duration and frequency.

8. Pay attention to subsurface conditions, including soil and sediment geochemistry and physics, groundwater quantity and quality, and infaunal communities. Inspect and characterize the soils in some detail to determine their permeability, texture, and stratigraphy. Highly

permeable soils are not likely to support a wetland unless water inflow rates or water tables are high. Characterize the general chemical structure and variability of soils, surface water, groundwater, and tides. Even if the wetland is being created or restored primarily for wildlife enhancement, chemicals in the soil and water may be significant, either for wetland productivity or bioaccumulation of toxic materials. At a minimum, these should included chemical attributes that control critical geochemical or biological processes, such as pH, redox, nutrients (nitrogen and phosphorus species), organic content and suspended matter.

9. Consider complications associated with creation or restoration in seriously degraded or disturbed sites. A seriously degraded wetland, surrounded by an extensively developed landscape, may achieve its maximal function only as an impaired system that requires active management to support natural processes and native species (NRC 1992). It should be recognized, however, that the functional performance of some degraded sites may be optimized by mitigation, and these considerations should be included if the goal of the mitigation is water- or sediment-quality improvement, promotion of rare or endangered species, or other objectives best served by locating a wetland in a disturbed landscape position. Disturbance that is intense, unnatural, or rare can promote extensive invasion by exotic species or at least delay the natural rates of redevelopment. Reintroducing natural hydrology with minimal excavation of soils often promotes alternative pathways of wetland development. It is often advantageous to preserve the integrity of native soils and to avoid deep grading of substrates that may destroy natural below-ground processes and facilitate exotic species colonization (Zedler 1996).

10. Conduct early monitoring as part of adaptive management. Develop a thorough monitoring plan as part of an adaptive management program that provides early indication of potential problems and direction for correction actions. The monitoring of wetland structure, processes, and function from the onset of wetland restoration or creation can indicate potential problems. Process monitoring (e.g., water-level fluctuations, sediment accretion and erosion, plant flowering, and bird nesting) is particularly important because it will likely identify the source of a problem and how it can be remedied. Monitoring and control of nonindigenous species should be a part of any effective adaptive management program. Assessment of wetland performance must be integrated with adaptive management. Both require understanding the processes that drive the structure and characteristics of a developing wetland. Simply documenting the structure (vegetation, sediments, fauna, and nutrients) will not provide the knowledge and guidance required to make adaptive “corrections” when adverse conditions are discovered. Although wetland development may take years to decades, process-based monitoring might provide more sensitive early indicators of whether a mitigation site is proceeding along an appropriate trajectory.